GRASSROOTS JOURNALS

Grassroots Journal of Natural Resources, Vol.8 No.2 (August 2025)
ISSN: 2581-6853 | CODEN: GJNRA9 | Published by The Grassroots Institute
Website: https://grassrootsjournals.org/gjnr | Main Indexing: Scopus and WoS

ISSN 2581-6853 | 8(2) August 2025

00550 | Research Article

Water Insecurity and Development Cooperation: Hungary's Engagement in Africa

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How to cite this paper: Ködmön, Z. (2025). Water Insecurity and Development Cooperation: Hungary's Engagement in Africa. *Grassroots Journal of Natural Resources*, 8(2): 1-27. Doi: https://doi.org/10.33002/nr2581.6853.080201

Received: 07 April 2025
Reviewed: 05 June 2025
Provisionally Accepted: 10 June 2025
Revised: 24 June 2025
Finally Accepted: 06 July 2025
Published: 21 August 2025
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Abstract

The Sustainable Development Report 2023 showed that 2.2 billion people lacked access to safely managed drinking water in 2022, with 703 million unable to access even basic services. In addition to this, the Afrobarometer's 2024 survey indicated that Sub-Saharan Africa water supply was ranked among the top governance challenges in 39 surveyed countries. This study explores regional and urban–rural disparities in access to drinking water, while also assessing the scope and geography of Hungary's water-related development cooperation on the continent. The methodology combines quantitative indicators from the UNICEF–WHO Joint Monitoring Programme with geospatial visualization techniques. The analysis reveals substantial inequalities in rural Eastern Africa, over 97 million people rely on surface water or unimproved sources, while Middle Africa reports more than 55 million in the same categories. In contrast, urban areas in Northern Africa show significantly better outcomes, with over 111 million having access to safely managed drinking water. These figures highlight persistent spatial divides and the critical need for targeted investment in rural service provision. Hungarian development engagement was examined through project records from the Ministry of Foreign Affairs and Trade, alongside publicly available data from Hungarian NGOs and private sector actors. The study finds that Hungary has contributed to water-related initiatives in countries such as the Democratic Republic of the Congo, Ghana, and Uganda, but has had limited involvement in other severely affected countries, including Niger (31% unsafe access), Madagascar (42%), and the Central African Republic (37%). This study addresses a significant research gap since the intersection of Hungarian development cooperation and African water security has received minimal scholarly attention to date. By offering a comprehensive, data-driven analysis of both African water access and Hungary's related foreign engagement, the research contributes to the understanding of potential synergies and future avenues for international collaboration in this field.

Keywords

International development; Sustainability; Water development; Water security

Introduction

In 1977, the UN Water Conference in Mar del Plata first considered water as both a vital physical resource and a socio-political development issue (Côrtes and Côrtes, 2021), which later led to the UN General Assembly recognizing clean, safe and affordable drinking water as a fundamental human right in its Resolution No. 64/292 (Omarova *et al*., 2019). Yet, access to clean and safely managed drinking water remains one of the most pressing global challenges of the 21st century. Despite international commitments under the Sustainable Development Goals (SDGs), particularly SDG 6, which aims to ensure the availability and sustainable management of water and sanitation for all by 2030, progress in many regions remains slow and uneven (Spijkers, 2020). In addition, scholars further emphasize that water access must be understood not only in terms of quantity but also in terms of quality, affordability, and safety (Santana, 2022; Shaheed *et al*., 2014; Vendhy *et al*., 2024).

In Africa, water insecurity is driven by a convergence of environmental, demographic, and institutional factors. Recurrent droughts, increasingly erratic rainfall patterns, and extreme weather events, exacerbated by climate change, undermine the reliability of water sources across vast regions. These environmental pressures are compounded by rapid population growth - Africa's population is expected to double by 2050, placing growing demands on already inadequate and fragmented water infrastructure. The impact of these factors is reflected in the latest Afrobarometer (2024) report, which found that little progress has been made in terms of access to safe drinking water in recent years, placing water supply as the fourth most important issue facing African governments.

Against this complex backdrop, Hungary has gradually redefined its role in international development cooperation. Although Hungarian engagement in Africa dates back to the 1960s, a strategic shift has been observed, particularly since 2010, marked by an increase in official development assistance and a diversification of sectoral priorities. Since 2010, Hungary has quadrupled the volume of its official development assistance (ODA) and more than tripled its ratio of ODA to gross national income by 2021. In addition, Hungary has shifted towards Africa, as the continent became the main recipient of ODA by 2021 (OECD, 2023). Water security has emerged as a key area of focus, involving actors from the Hungarian public sector, civil society, and – to a lesser extent – the private sector. These activities range from infrastructural investments and technology transfer to capacity-building and humanitarian aid. This paper seeks to answer for the following research questions: (1) What are the regional and urban–rural disparities in access to safely managed drinking water in Africa based on JMP data? (2) How is Hungarian development cooperation geographically distributed in Africa's water sector, and what gaps remain? By examining these two questions, the objective of the study is to identify countries and regions where Hungarian involvement is already present, as well as those where future contributions could be targeted more effectively. A secondary objective of the study is to address a noticeable gap in the academic literature. In the Hungarian-language literature, there are studies that examined Hungarian-African relations in the 20th century (Hollósi, 2010; Tarrósy, 2020; Solymári and Tarrósy 2021), as well as those that examined the relations between Hungary and Africa from a security policy perspective (Besenyő, 2013; Marsai and Tarrósy, 2024). In the English-language literature, the studies also focus on the

relations in the 20th century (Tarrósy 2025; Tarrósy and Solymári 2022). In these studies, the water developments are only mentioned, but none of them examine this activity in detail. Therefore, based on publicly accessible sources, both Hungarian and international scholarly works seldom address the intersection of Hungary's development cooperation and African water security. By integrating spatial analysis with policy mapping, the study addresses this critical gap in the literature at the intersection of development geography, foreign policy, and water governance.

Methodology

Quantitative data on drinking water access derive from the 2022 edition of the Joint Monitoring Programme (JMP), maintained by UNICEF and the World Health Organization. JMP staff systematically survey the websites of national statistical offices and key sector institutions (e.g., ministries of water and sanitation, drinking-water regulators), while continuously reviewing regional and global databases for newly available datasets. In collaboration with UNICEF and WHO regional and country offices, they identify and incorporate household surveys, censuses, and administrative records. The resulting JMP database thus comprises national censuses, representative household surveys, service-provider inventories, and regulatory reports, as well as supplementary compilations from international initiatives and research institutes (WHO-UNICEF, 2018). Although the JMP database includes data spanning from 2000 to 2022, the present study focuses exclusively on the most recent and complete dataset available, which corresponds to the year 2022. This decision was made as the objective of this study is not to analyze temporal trends but rather to provide a snapshot of the current state of drinking water access across African regions. The study accessed data via the official JMP online data portal, which provides downloadable datasets in CSV and Excel formats. The study utilized the dataset categorized under the "UN M49 subregions", as this classification provides specific coverage of African subregions, including Eastern Africa, Middle Africa, Northern Africa, Southern Africa, and Western Africa. Within each subregion, the database offers disaggregated data by area type (urban and rural), allowing for a spatial analysis of water access disparities.

The study extracted raw data directly from the JMP platform and subsequently processed and organized it using Microsoft Excel. Data cleaning steps included filtering the relevant subregions and organizing indicators into comparative regional categories. Visualizations are generated to support the interpretation of findings, employing bar charts to highlight regional disparities and rural-urban divides. The JMP compiles its data through a standardized methodology that integrates national household surveys and censuses, applying harmonized definitions and classifications to ensure cross-country comparability. Therefore, the data used in this study are based on nationally representative sources and adhere to international monitoring standards, which enhances their reliability for regional-level comparative analysis (WHO-UNICEF, 2022). To interpret these data, the study adopts the JMP's drinking water service ladder (WHO-UNICEF, 2018), a conceptual framework designed to benchmark and monitor service levels globally.

Table 1: The Joint Monitoring Programme service ladder for drinking water

Safely managed	Drinking water from an improved water source that is accessible on premises, available when needed, and free from faecal and priority chemical contamination
Basic	Drinking water from an improved source, provided collection time is not more than 30 minutes for a round trip, including queuing.
Limited	Drinking water from an improved source for which the collection time exceeds 30 minutes for a round trip, including queuing
Unimproved	Drinking water from an unprotected dug well or unprotected spring
Surface water	Drinking water directly from a river, dam, lake, pond, stream, canal, or irrigation canal

This ladder builds upon the earlier improved/unimproved classification, expanding it with a more detailed set of service categories that better reflect water quality, accessibility, and reliability. According to the JMP, improved drinking water sources are those that, by their design and construction, have the potential to deliver safe water. These include piped water systems, boreholes or tubewells, protected wells and springs, rainwater harvesting systems, and packaged or delivered water. Within this group, the highest level of service is referred to as safely managed drinking water, defined as water from an improved source that is accessible on premises, available when needed, and free from faecal and priority chemical contamination. If an improved source does not meet one or more of these three criteria, but water collection takes no more than 30 minutes round-trip (including queuing), it is classified as basic service. If the collection time exceeds 30 minutes, the service is considered limited. Populations using unprotected dug wells or springs are classified as having unimproved service, while those collecting water directly from rivers, lakes, ponds, or canals fall into the surface water category, representing the absence of formal service provision (WHO-UNICEF, 2018).

The study uses the JMP service ladder as the analytical framework to categorize drinking water access levels across African subregions. Data for each service category – namely, safely managed, basic, limited, unimproved, and surface water – were extracted for both urban and rural populations in each subregion, using the most recent (2022) figures available. The analysis considered both relative values – percentage of the population within each service category – and absolute population numbers. This dual approach enabled a comprehensive understanding of disparities not only in proportional terms but also in terms of the actual number of people affected. By applying the ladder classification to urban and rural datasets, the study can highlight inequalities in service levels between and within subregions. Special emphasis is placed on the proportion and absolute number of the population relying on unimproved services and surface water sources, which reflect the most vulnerable groups with no or highly constrained access to safe drinking water. Visualization of the data is used to effectively communicate these disparities and to support further interpretation of spatial and demographic patterns. This method allowed for a structured comparison of regional water access conditions, grounded in internationally recognized service definitions, and provided evidence for identifying critical areas where water service provision remains insufficient.

The framework for Hungary's development engagement is provided by the fact that Following its rotating presidency of the Council of the European Union from January to June 2011, the Hungarian government introduced a new foreign policy strategy called "Global Opening". Under this strategy, Hungary aimed to revive its relations with sub-Saharan African countries, with which it had once maintained intensive relations, especially during the Cold War era (Tarrósy and Morenth, 2013). The other theoretical framework regarding Hungary's development role can be approached in relation to investments that promote the implementation of sustainable development goals. According to the World Investment Report 2023, the annual SDG investment gap in developing countries has widened from $2.5 trillion in 2015 to $4 trillion by 2022. Regarding the specific SDG goals, the water and sanitation category was the second with the largest deficit as of 2022 (UNCTAD, 2023). Therefore, it is important to examine Hungary's role in this context as well, in what way has Hungary contributed to the realization of SDG 6 goal for the African continent so far. Hungarian engagement in African water security was examined using the International Development Cooperation Mapping Tool developed by the Ministry of Foreign Affairs and Trade of Hungary (Ministry of Foreign Affairs and Trade of Hungary, 2020). This platform includes data on Hungary's official development cooperation projects, programs, and initiatives across partner countries between 2018 and 2020. Complementing this, additional data were collected through manual searches of publicly available online sources to identify Hungarian private sector actors and non-profit organizations active in Africa's water sector. During this process, only those organizations were selected whose headquarters located in Hungary and implemented at least one water project in Africa. As a result, 2 companies from the private sector, namely Pureco and Geogold Kárpátia and 2 humanitarian organizations, namely the Hungarian Charity Service of the Order of Malta's and the Afrikáért Alapítvány (Foundation for Africa) could be found, for which there is available information on their presence in Africa. In the case of these companies and organizations, the location and the description of the projects they implemented, and the volume – if information was available – were analyzed. Considering the study's exclusive focus on water projects, only a domestic Hungarian database could be identified, and no comprehensive project-level database exists. Consequently, data were supplemented and cross-checked using various corporate and governmental reports, with all sources and associated limitations documented in the study's Limitations section.

The Microsoft Excel is used to visualize the collected data on drinking water access across urban and rural areas in Africa, by service level and region in the results section. Additionally, a geospatial analysis was conducted with the aid of QGIS software to map the geographical distribution of Hungarian water-related engagements and the use of unimproved and surface water services per 100,000 people in Africa. Different layers were needed to produce the map. The first layer contains African countries and their borders. The given layer was created by the IGAD Climate Prediction and Application Center, an East African climate center accredited by the World Meteorological Organization that provides climate services to 11 East African countries (ICPAC Geoportal, 2017). The second layer indicates the per capita usage of unsafe water per 100,000 people. The severity ranges from green to red, the more people use water from surface or unimproved sources in the country per 100,000 people, the redder the country is marked. The third layer shows – indicated by different icons – in which African countries the actors in the study are present. The icons indicating the presence of the

Government of Hungary and Hungary's General Directorate of Water Management cannot be linked to exact project locations on the map, as they do not name a specific location on their official websites, but only the country. In contrast, the icons for Hungarian private sector companies and non-profit organizations show the exact location of their presence. The map was created using project-level data, including GPS coordinates provided and curated by the author. The location can be found in the project descriptions on the examined actors' websites and the GPS coordinates of these locations were extracted by Google Maps.

Literature Review

Climatic drivers of water insecurity in Africa

Water insecurity in Africa is driven by a complex interplay of environmental, social, and economic factors; thus, understanding these dimensions is essential for addressing the continent's growing water challenges. Climate change is one of the most critical drivers shaping water security across Africa. The African continent is warming earlier than any other continent, as global projections predict a temperature increase of 3-4°C in the 21st century, which one of the negative consequences is water scarcity (Anozie et al., 2025). Increasingly frequent droughts, erratic rainfall patterns, and extreme weather events are disrupting the hydrological cycle, reducing freshwater availability, and exacerbating regional disparities. According to Wang *et al*. (2022), those regions that face unreliable rainfall patterns and weather variability experience severely compromised access to drinking water. This climatic influence can lead to seasonal shortages or surpluses, affecting water quality and availability throughout the year (Dongzagla, Jewitt and O'Hara, 2021). Tierney, Ummenhofer and de Menocal (2015) highlight that in regions with bimodal rainfall patterns, such as East Africa, variability in the timing and intensity of rainy seasons can significantly disrupt the expected recharge of aquifers and surface reservoirs, thereby enhancing water insecurity. Due to the changing precipitation patterns, Swe *et al*. (2021) project that many regions across sub-Saharan Africa will struggle to achieve universal access to drinking water by 2030. In addition to the fluctuations in seasonal rainfall patterns, drought represents one of the most severe and persistent threats to water security in Africa. Surface water levels are reduced during extended drought periods, which restricts access for communities that depend on rivers, lakes, and reservoirs (Noushadali, 2021).

As groundwater reserves are depleted during drought, competition for remaining water resources intensifies, often leading to increased costs and socio-economic tensions among users (Ahmed, Guerrero-Flórez and Karanis, 2018). In addition, drought-related water scarcity makes people more dependent on alternative, frequently lower-quality water sources, which raises the risk of health issues linked to contaminated drinking water (Hoque and Hope, 2018). Moreover, the impacts of drought on water supply are often long-lasting, as years of little rainfall can lead to a permanent reduction in aquifer recharge rates, affecting water security for communities (Wright *et al*., 2013). According to Naumann *et al*. (2018) and Gan *et al*. (2016), drought conditions are anticipated to worsen, as climatic models predict an increase in the frequency and severity of such events in the future, particularly as a result of altered precipitation patterns and warming temperatures across Africa. Nevertheless, water insecurity in Africa is not solely a result

of scarcity and drought, since excessive water in the form of floods also poses serious risks. The direct impacts of flooding can destroy infrastructure, damaging water treatment plants, distribution networks, and pumping stations, thus severely disrupting the delivery of safe drinking water (Howard *et al*., 2016). In addition, in some cases, flooding can even render entire supply systems non-functional for extended periods, necessitating costly repairs and rehabilitation (Gargano *et al*., 2015).

Water provision challenges across urban and rural areas in Africa

Another challenge besides climate change is the rapid population growth across Africa, which is placing increasing pressure on water resources and service systems. According to the United Nations (2017) population of Africa is projected to reach approximately 2.5 billion by 2050, a near doubling from current figures, which intensifies the competition for limited water resources. Water infrastructure across Africa is marked by significant disparities in quality, coverage, and functionality, with many regions relying on fragmented, outdated, or inadequate systems that struggle to meet growing demand. According to Bain *et al*. (2014), many urban areas in Africa have developed piped water supply systems, which connect households to centralized sources of treated water; however, they often face challenges such as intermittent supply, inadequate treatment capacity, and aging infrastructure. Moreover, Tseole *et al*. (2022) highlight that they require significant ongoing maintenance and investment, but urban municipalities often struggle to maintain infrastructure amid rapid urbanization. However, Kerpaci and Lako (2024) highlights that technological and infrastructural developments are essential to improve the efficiency of water supply and wastewater treatment systems in the face of climate change and urbanization, which are becoming essential elements of sustainable development.

In rural areas, boreholes drilled into aquifers are a significant source of drinking water. These are often installed with hand pumps or mechanized pumps to draw groundwater for domestic use (Healy *et al*., 2020). Boreholes provide a relatively safe source of drinking water but can be vulnerable to pollution if not properly managed. The sustainability of these systems relies on groundwater recharge rates and the community's ability to maintain and manage the facilities (Fisher *et al*., 2015). Also, the long-term viability of boreholes is often challenged due to inadequate maintenance resources and technical expertise, leading to a higher incidence of breakdowns and contamination (Murei *et al*., 2022). Furthermore, many rural communities develop their water supply systems that rely on local resources and community management, including rainwater harvesting and community taps. In addition, Tseole *et al*. (2022) emphasize that the success of community-based systems is heavily reliant on community engagement and maintenance capabilities. Often, these systems face significant challenges when community participation wanes, leading to a lack of accountability and neglect; thus, without external support, these infrastructures risk becoming non-functional due to inadequate resources for upkeep. The sachet water industry has seen remarkable growth in regions where the municipal water supply is limited. Sachet water, which consists of small plastic bags filled with treated water, has become a popular alternative due to its affordability and convenience, particularly in urban West African settings like Ghana and Nigeria (Lapworth *et al*., 2017). However, while sachet water can provide a temporary solution, concerns about its quality and the environmental impact of plastic

waste persist (Udoh *et al*., 2021). Beyond sachets, bottled water is also available in many urban centers, offering an improved alternative to some untreated sources. However, access to bottled water is often limited by higher costs, making it less accessible to lower-income households (Danert and Healy, 2021).

The impacts of the factors determining water security in Africa also appear at the societal level. According to UNICEF (2014), African populations collectively spend over 40 billion hours each year walking to collect water, with the burden falling disproportionately on women and girls. This not only reduces their time for education and economic activity but also exposes them to risks such as violence in insecure environments. Moreover, inadequate water, sanitation, and hygiene facilities in schools negatively affect children's health and academic performance, reinforcing cycles of poverty and inequality (Sharma *et al*., 2024). The IOA Africa (2024) has reframed water insecurity in Africa as a multidimensional governance crisis, driven by institutional fragmentation, urbanization, and inequality, where technical solutions alone are insufficient. Effective water management, according to this view, requires inclusive planning, community ownership, and strengthened local capacity.

One of the crucial ways urbanization influences water supplies is through the demand it creates, because of the expansion of urban areas, the proportion of the population relying on municipal water services increases. According to Malemba and Masinde (2023), in many cities, particularly in sub-Saharan Africa, the water demand exceeds supply, thus leading to systemic pressure on existing infrastructure, which is often outdated or insufficient. Moreover, Deshpande *et al*. (2020) highlight that urbanization contributes to the emergence of informal settlements, which lack basic infrastructure, including access to clean drinking water and sanitation, thereby exacerbating inequalities in access.

Historical evolution of Hungary – Africa development cooperation

Hungary's engagement with Africa has evolved considerably over time, reflecting shifts in political ideology, economic priorities, and diplomatic strategy. During the socialist era, Hungary's five-year development plans featured dedicated aid programs aimed at African countries, primarily facilitated through intergovernmental loans and technology transfer initiatives. In 1962, the establishment of the International Technical and Scientific Cooperation and Trading Office (TESCO) marked a significant institutional commitment to coordinating bilateral agreements in technical assistance, education, and vocational training, as well as managing state-funded infrastructure projects in key sectors, including water management (Solymári and Tarrósy, 2021). By 1973, TESCO had deployed 92 Hungarian experts across Sub-Saharan Africa – mainly in Nigeria, but also in countries such as Tanzania, Ghana, Ethiopia, Kenya, Uganda, and others – thereby not only delivering technical support but also enhancing Hungary's reputation in the Global South (Búr, 2021).

Marsai and Tarrósy (2021) emphasize that the revival of African relations is not only rooted in historical traditions but is also a consequence of the emerging multipolar world order and Africa's growing geopolitical, political, and economic importance. Since the 2010s, Hungarian foreign policy has shifted toward broader global outreach, with the Southern Opening strategy aiming to re-establish ties, especially in the Sahel. This

strategy goes beyond rebuilding diplomatic and political ties, placing a strong emphasis on soft power instruments such as cultural, educational, and economic cooperation. In subsequent decades, Hungary continued to build on these foundations. In July 2011, Deputy State Secretary János Hóvári visited Sudan to strengthen bilateral relations and signed a memorandum of understanding with the Sudanese Ministry of Foreign Affairs, focusing on sectors including water management, energy, IT, and agriculture. This visit, which also involved Hungarian business representatives exploring investment opportunities, indicates the ongoing importance of Africa within Hungary's foreign economic agenda (Borza, 2020). Furthermore, Hungary's longstanding relationship with Ghana illustrates another dimension of its engagement with Africa. Historically, numerous Ghanaian students benefited from Hungarian scholarships during the Cold War era. This relationship experienced a revival under the 2015 Opening to the South policy, which identified Ghana as a priority partner due to its political stability and dynamic economic growth. Cooperation with Ghana now spans sectors such as wastewater treatment, renewable energy, agriculture, and education, reflecting an increased role for Hungarian expertise and investment in the region (Remek, 2020).

Hungary's international development cooperation framework reveals a coherent evolution from strategic policy to legally binding implementation and focused regional engagement. The NEFE Policy Strategy of 2013 initially established the country's overarching objectives – such as poverty alleviation, democratic governance, and sustainable development – with specific geographic and sectoral priorities (The Government of Hungary, 2013). This was subsequently reinforced by Act XC of 2014[1], which codified these principles within a legal framework that ensures transparency, accountability, and alignment with international norms set by the United Nations and the OECD (Act XC of 2014, 2014). The NEFE2025 Strategy further refined this policy direction by incorporating lessons learned from previous efforts and adapting to emerging global challenges, thereby emphasizing increased bilateral cooperation and optimized resource allocation across key regions (The Government of Hungary, 2019). Complementing these documents, the Ministerial Decree No. 5/2020[2] provides detailed definitions and procedural guidelines for various forms of development cooperation, ranging from project-based to program-based initiatives, ensuring efficient and accountable aid delivery (Ministerial Decree No. 5/2020, 2020). Moreover, The Government Decree No. 1177/2019[3] outlines Hungary's strategic approach toward Africa, with a particular focus on sub-Saharan regions. It emphasizes addressing migration challenges by boosting economic development, creating jobs, and enhancing local livelihoods through stronger bilateral and multilateral ties with African countries. The resolution assigns the Ministry of Foreign Affairs and Trade, alongside other key

[1] Act XC of 2014 on International Development Cooperation and International Humanitarian Assistance (2014. évi XC. törvény a nemzetközi fejlesztési együttműködésről és a nemzetközi humanitárius segítségnyújtásról). Nemzeti Jogszabálytár. Available online at: https://njt.hu/jogszabaly/2014-90-00-00 [Accessed on 10 March 2025].

[2] Ministerial Decree No. 5/2020 (28 February) of the Ministry of Foreign Affairs and Trade on the Forms of International Development Cooperation Activities (5/2020. (II. 28.) KKM rendelet a nemzetközi fejlesztési együttműködési tevékenység formáiról). Nemzeti Jogszabálytár. Available online at: https://njt.hu/jogszabaly/2020-5-20-6Q [Accessed on 10 March 2025].

[3] Government Decree No. 1177/2019 (2 April) on the Africa Strategy (1177/2019. (IV. 2.) Korm. határozat az Afrika stratégiáról). *Nemzeti Jogszabálytár*. Available online at: https://njt.hu/jogszabaly/2019-1177-30-22 [Accessed on 10 March 2025].

ministries, to investigate and dismantle administrative and technical barriers for Hungarian exporters and investors in the region. It further mandates the development of comprehensive project concepts in areas such as water management, infrastructure, security, agriculture, and health, while exploring innovative financial mechanisms like tied aid loans. Additionally, the resolution calls for the establishment of collaborative advisory groups and the organization of the Budapest Africa Forum, thereby integrating economic, diplomatic, and development policy objectives to strengthen Hungary's strategic presence in sub-Saharan Africa (Government Decree No. 1177/2019, 2019[4]). Collectively, these instruments demonstrate an integrated approach whereby policy formulation, legal enforcement, operational procedures, and targeted regional strategies work in concert to advance Hungary's role in international development cooperation and humanitarian assistance.

Tied aid credits are a central instrument of Hungary's international development policy and the only internationally recognized form of state export support. The 2020 Tied Aid Credit Strategy aligns OECD guidelines with Hungary's foreign policy goals, particularly the Eastern and Southern Opening strategies and the National Export Strategy 2030. These credits support financially non-viable projects delivering public goods in key sectors such as agriculture, healthcare, infrastructure, IT, and water management, while also fostering bilateral relations and promoting Hungarian expertise abroad. The program is coordinated by the Ministry of Foreign Affairs and Trade in cooperation with the Hungarian Export-Import Bank Plc. and the Hungarian Export Credit Insurance Plc., which are the lender and insurer institutions (Ministry of Foreign Affairs and Trade of Hungary 2021). Since 2010, Hungary has significantly expanded its official development assistance (ODA), quadrupled its total volume and increased its ODA-to-GNI ratio to 0.29% by 2021. While its overall presence in least developed countries (LDCs) remains limited, Hungary's 2020–2025 strategy prioritizes increased engagement with Africa and LDCs. This shift is reflected in Africa becoming the top regional recipient of Hungarian ODA in 2021 ($62 million), up from third place in 2020 ($22 million). Nonetheless, no African country ranked among Hungary's top 10 individual ODA recipients in 2020, indicating room for more targeted bilateral engagement (OECD, 2023).

Results

Access to Water Services Across Africa

By conducting a comparative analysis of safely managed water service coverage across Africa's major regions – North, West, East, Central, and Southern – while disaggregating urban and rural populations, the aim is to reveal critical spatial disparities across the continent.

[4] Government Decree No. 1177/2019 (2 April) on the Africa Strategy (1177/2019. (IV. 2.) Korm. határozat az Afrika stratégiáról). *Nemzeti Jogszabálytár*. Available online at: https://njt.hu/jogszabaly/2019-1177-30-22 [Accessed on 10 March 2025].

Tables 2a: Drinking water access across urban and rural areas in Africa, by service level and region (a) Percentage

	Region	*Type*	*Basic service*	*Limited service*	*Surface water*	*Safely managed service*	*Unimproved*
(a) Percentage	Eastern Africa	Urban	30,27696	10,52679	1,74806	53,51623	3,93196
		Rural	34,77723	22,44169	10,80704	13,47076	18,50328
	Middle Africa	Urban	28,8772	21,04935	0,87388	38,65702	10,54255
		Rural	22,41209	15,94878	15,69525	2,89684	43,04704
	Northern Africa	Urban	14,23616	4,11272	0,06705	81,06976	0,51431
		Rural	84,52271	9,23486	0,82971	0	5,41272
	Southern Africa	Urban	18,76653	0,80971	0,06904	80,0843	0,27041
		Rural	81,81322	8,30787	5,5027	0	4,3762
	Western Africa	Urban	50,15736	3,911	0,75407	41,75455	3,42303
		Rural	40,54727	11,0726	7,39248	19,55728	21,43036

Tables 2b: Drinking water access across urban and rural areas in Africa, by service level and region (b) Population distribution as of 2022

	Region	*Type*	*Basic service*	*Limited service*	*Surface water*	*Safely managed service*	*Unimproved*
(b) Population distribution	Eastern Africa	Urban	42 946 013	14 931 602	2 479 518	75 909 492	5 577 249
		Rural	115 168 625	74 318 134	35 788 684	44 609 905	61 275 627
	Middle Africa	Urban	29 267 510	21 333 852	885 692	39 179 514	10 685 048
		Rural	21 230 142	15 107 684	14 867 525	2 744 070	40 776 863
	Northern Africa	Urban	19 507 809	5 635 658	91 876	111 089 854	704 759
		Rural	103 912 219	11 353 332	1 020 051	0	6 654 392
	Southern Africa	Urban	8 482 285	365 981	31 207	36 197 308	122 224
		Rural	19 144 035	1 944 015	1 287 615	0	1 024 018
	Western Africa	Urban	105 290 337	8 209 974	1 582 943	87 651 158	7 185 621
		Rural	88 865 387	24 267 261	16 201 727	42 862 695	46 967 831

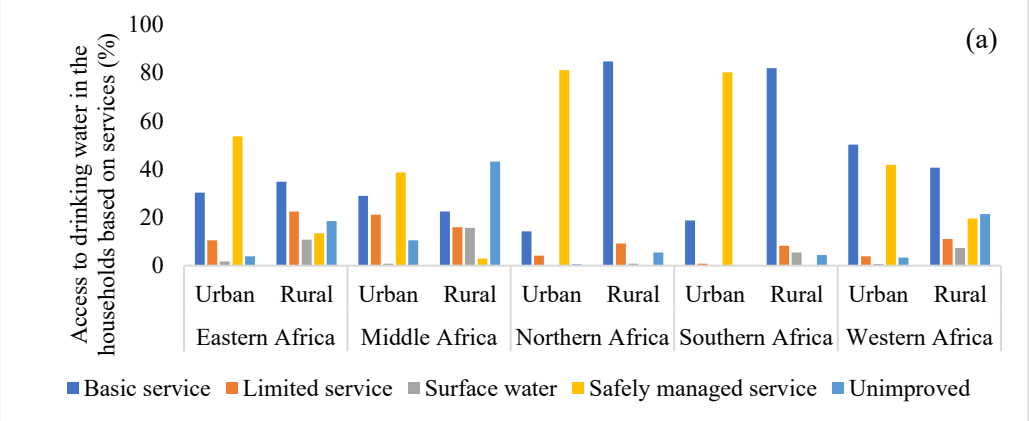

Figure 1a: Drinking water access across urban and rural areas in Africa, by service level and region (a) Percentage

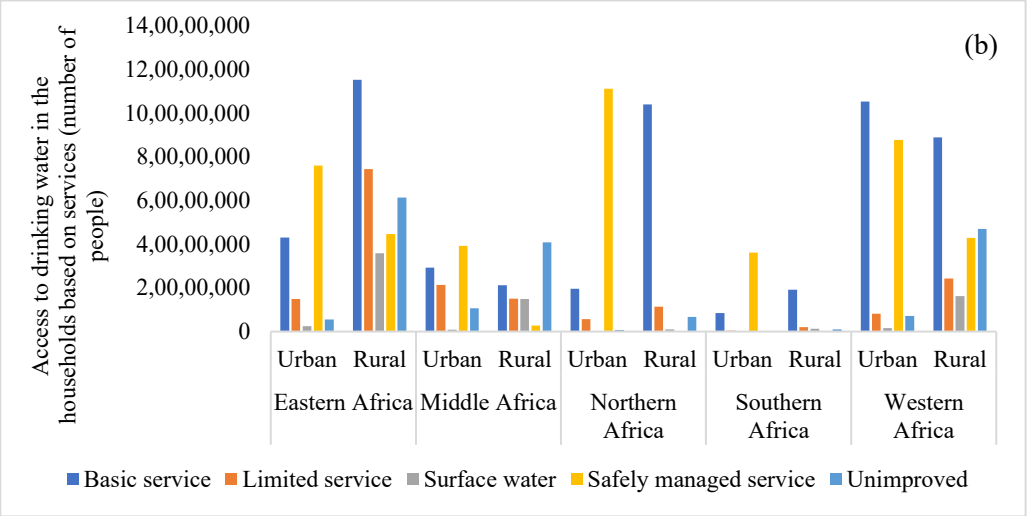

Figure 1b: Drinking water access across urban and rural areas in Africa, by service level and region (b) Population distribution as of 2022

According to table 2 and figure 1, the availability and quality of drinking water services across Africa show disparities, both regionally and between urban and rural areas. Northern and Southern Africa show the highest levels of safely managed water services in urban areas, with 81.1% (111 million people) and 80.1% (36 million people) coverage, respectively. In contrast, rural areas in these same regions lag significantly behind. For instance, rural Northern Africa reports 0% safely managed service and 84.5% (103 million people) reliance on basic services, while rural Southern Africa reports similarly low safely managed coverage and over 81% (19 million people) reliance on basic services. Although basic services still provide improved sources, the lack of comprehensive safety monitoring and consistent availability exposes rural populations to greater vulnerability. Eastern and Western Africa present a more mixed picture. Urban areas in both regions demonstrate moderate levels of safely managed services – 53.5% (75 million people) in Eastern and 41.8% (87 million people) in Western Africa – while rural areas show significantly reduced coverage (13.5% and 19.6%, respectively, equaling 44 million and 42 million people). Notably, surface water usage remains high in rural Eastern and Western Africa (10.8% and 7.4%, equal to 36 million and 16 million people), posing serious health risks, particularly in regions lacking effective water treatment infrastructure. Middle Africa stands out as the most water-insecure subregion. Urban safely managed water service coverage is relatively low at 38.7% (39 million people), while rural coverage drops drastically to just 2.9% (3 million people). Alarmingly, over 43% (41 million people) of rural residents in Middle Africa rely on unimproved water sources, and nearly 16% (15 million people) depend on surface water. These figures highlight critical infrastructural deficits and point to systemic inequality in access. Therefore, urban populations consistently enjoy better access to improved services, particularly to safely managed drinking water across all regions of Africa. Based on the UNICEF-WHO (2023) database, the water service availability in schools and healthcare facilities across African regions also shows critical inequalities, especially in rural areas. In Middle and Eastern Africa, a high share of urban schools lack water entirely (58.9% and 17.1% respectively), while rural healthcare facilities in these same regions show alarming rates of no service, 23.3% in Eastern Africa and 35.8% in Middle Africa. Conversely, Northern Africa leads with relatively high coverage, as 77.6% of urban healthcare facilities

have basic services, and limited service or total lack remains minimal. Western Africa shows mixed outcomes, with basic access in some urban schools and clinics, yet over 26% of rural health facilities still lack any water service.

A comprehensive analysis that integrates three key indicators – per capita usage of unsafe water (per 100,000 people), absolute number of people affected, and percentage of the population exposed – provides a more complete picture of where the global water crisis is most acute. The ten countries listed were selected based on scaled values of the number of people relying on unimproved or surface water supplies (per 100,000 inhabitants), which shows which countries have the most severe proportional shortages, regardless of the size of their total population, and which should be prioritized for targeted intervention and resource allocation. When ranked by percentage of the population relying on surface or unimproved water sources, Madagascar leads in Africa with 42.02% of its population lacking access to safe drinking water, the Democratic Republic of Congo follows closely at 40.92%, while Central African Republic (37.07%), Chad (35.46%), Angola (32.98%), and Niger (31.47%) also report alarmingly high proportions. These figures show that in each of these countries, at least one in three individuals is directly affected by unsafe water use. Simultaneously, countries like the Democratic Republic of Congo and Madagascar appear at the top of both absolute numbers and per 100,000 exposure rates. Democratic Republic of Congo, for example, has over 40.5 million people relying on unsafe water sources, while Madagascar records over 40,878 individuals per 100,000 – both placing them among the most critically affected nations on all three metrics (Table 3).

Table 3: Population reliant on unimproved or surface water services by country (2022): Absolute Numbers, Percentage, and Scaled Values (per 100,000). Sort by Scaled Values (per 100,000)

Country	*Absolute Numbers*	*Percentage*	*Scaled Values (per 100,000)*
Madagascar	12 442 110	42.02	40 877
Central African Republic	2 068 169	37.07	40 567
Democratic Republic of the Congo	40 518 623	40.92	39 570
Chad	6 285 170	35.46	34 056
Angola	11 738 248	32.98	32 940
Niger	8 247 845	31.47	32 584
Kenya	15 387 238	28.48	28 362
Sierra Leone	2 342 921	27.22	28 307
Mozambique	8 906 238	27.01	27 272
Zambia	5 074 420	25.35	25 179

This convergence of scale, intensity, and proportionality highlights them as epicenters of the global water crisis. Meanwhile, countries such as the Central African Republic and Chad, although smaller in population, show extreme per capita and percentage-based exposure, pointing to situations where unsafe water access is not an exception but a norm. Angola and Niger, while sometimes overlooked due to less media visibility, also exhibit conditions that merit urgent development and humanitarian intervention, given that nearly a third of their populations remain unserved by basic water infrastructure.

Table 3 provides an overall picture of where the per capita burden of dependence on unimproved or surface water supplies is highest. Such elevated scaled values, regardless of the total population of the country, point to deep infrastructure gaps and governance weaknesses, particularly in rural areas, as already highlighted in figure 1. Consequently, these results suggest that targeted investments in water supply networks, institutional capacity building, and community-led governance models are urgently needed to bridge the most severe development gaps and accelerate progress towards Sustainable Development Goal 6 in the most severely affected countries.

Hungary's Engagement in Water Sector Development

The analysis explores Hungary's post-2010 engagement in water security initiatives across the African continent. As water-related challenges have become increasingly central to both global development agendas and regional stability in Africa, Hungary has gradually intensified its involvement in this sector through a different approach. The Hungarian government, alongside public sector agencies, private enterprises, and nonprofit organizations, has contributed to a diverse range of water-related activities, from infrastructural development and technology transfer to humanitarian aid and capacity-building programs. These actions reflect not only Hungary's evolving international development policy but also its strategic intent to expand its global partnerships beyond the European Union. The comprehensive visualization presented in the following map (Figure 2) offers an integrated overview of Hungary's water security interventions in Africa, highlighting the geographical distribution and sectoral diversity of these efforts.

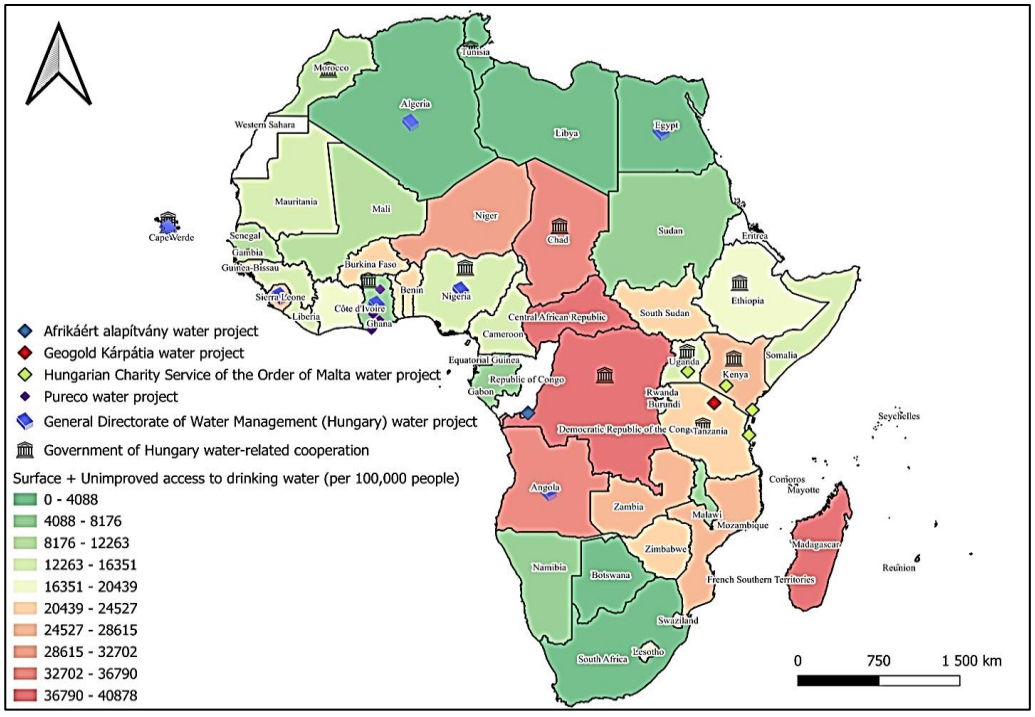
Afrikáért alapítvány water project
Geogold Kárpátia water project
Hungarian Charity Service of the Order of Malta water project
Pureco water project
General Directorate of Water Management (Hungary) water project
Government of Hungary water-related cooperation
Surface + Unimproved access to drinking water (per 100,000 people)
0 - 4088
4088 - 8176
8176 - 12263
12263 - 16351
16351 - 20439
20439 - 24527
24527 - 28615
28615 - 32702
32702 - 36790
36790 - 40878
0
750
1 500 km

Figure 2: Hungarian engagement in Africa by actor type (indicated by symbols) and the use of unimproved and surface water services per 100,000 people (indicated by colors)

Hungary's General Directorate of Water Management has become an increasingly active actor in Africa-focused water diplomacy. Between 2015 and 2021, the General Directorate of Water Management established institutional partnerships with seven African countries – including Egypt, Nigeria, Algeria, Angola, Ghana, Cape Verde, and Sierra Leone – focusing on knowledge exchange, flood management, and integrated water resources planning. These collaborations reflect Hungary's broader strategy to share its technical expertise in areas such as river basin management, climate adaptation, and transboundary water governance. By building institutional ties in both North and West Africa, the General Directorate of Water Management contributes to expanding Hungary's development footprint beyond project implementation into long-term technical cooperation (General Directorate of Water Management, 2024).

Between 2018 and 2020, the Hungarian government supported a range of targeted development interventions in Africa that addressed critical water security challenges, in alignment with Sustainable Development Goal 6. During this period, eight countries – Cape Verde, Ethiopia, Ghana, Kenya, Nigeria, Tanzania, Tunisia, and Uganda – received funding for water-related projects, each focusing on various aspects of water supply, sanitation, and integrated water management. In total, 10 projects were implemented, amounting to a combined value of approximately $3.9 million. Ethiopia and Uganda were the primary recipients in financial terms, with projects valued at $1.66 million and $1.58 million, respectively. These initiatives included refugee camp water supply infrastructure, flood prevention and waste decontamination systems, and contributions to adaptive water management programs. By contrast, countries such as Nigeria and Cape Verde received relatively modest allocations, with projects focusing on hydrogeological research and climate-adapted sewage management, respectively. The relative weight of these projects within Hungary's total bilateral development assistance varied considerably. In Ethiopia and Cape Verde, water-related interventions represented a significant share – 37.47% and 26.37%, respectively – of Hungary's overall aid to those countries. In contrast, countries such as Nigeria (0.74%) and Ghana (0.85%) received water-related support as a minor component of broader cooperation frameworks (Ministry of Foreign Affairs and Trade of Hungary, 2020).

While the earliest of these relevant agreements with Nigeria dates back to 2016 (The Government of Hungary, 2016), a significant expansion occurred after 2020, including new agreements with Tunisia in 2023 (The Government of Hungary, 2023), the Democratic Republic of Congo, Morocco, Chad, Cape Verde in 2024 (The Government of Hungary, 2024a; 2024b; 2024c; 2024d), and Tanzania (2025). These agreements reinforce the institutional and diplomatic frameworks that enable future technical cooperation, capacity development, and project-based collaboration in the field of water security. In Tanzania, a landmark agreement concluded in 2025 outlines the utilization of Hungarian water technology within a $55 million development cooperation framework, indicating a significant scaling-up of prior engagements (The Government of Hungary, 2025). Similarly, negotiations are ongoing with Chad as of 2024 regarding the launch of a €150 million tied aid credit program, which aims to bolster the presence of Hungarian water industry companies and contribute to the modernization of the country's water sector (The Government of Hungary, 2024c). The primary goal of this initiative is to expand access to clean and safe drinking water across the population. Meanwhile, in Cape Verde, cooperation reached a new phase in 2024 with the signing

of an additional agreement worth €7 million, bringing the total tied aid commitment to €42 million (The Government of Hungary, 2024d). This financing supports the construction of water management and irrigation systems that serve both local communities and create opportunities for Hungarian engineers and enterprises active in the water industry.

Two Hungarian-based players have already implemented at least one project in Africa. One of the companies is Pureco, which has been receiving significant recognition for the development of Ghana's water and sanitation sector in recent years. One of their projects was implemented in the town of Akim Wenchi – a town of about 12,000 inhabitants – where a modular, mobile PurAID water purification plant was installed to treat contaminated public well water. With a capacity of 10 m³/day, it removes iron, manganese and pathogenic bacteria without the use of harmful chemicals. Furthermore, the system has remote monitoring and automatic shutdown in case of water quality hazards. This project was the first to deploy this Hungarian technology, in partnership with Ghana's Community Water Sanitation Agency (Puraset, 2025). In addition, the company was able to implement a much larger-scale investment in Kumasi with the support of the Hungary's Ministry of Foreign Affairs and Trade. The project volume was 10 million, and a municipal wastewater treatment plant was built, which treats 1000 m³ of wastewater per day and serves 200,000 residents. The project also included infrastructural capacity building, but also included training of local operators to ensure long-term sustainability (Pureco, 2025). Furthermore, In Takoradi, a Hungarian-designed vertical 500 m³ water storage tank was installed at the local wastewater treatment plant to ensure the facility's operational water needs. This project illustrates the validity of Hungarian water technology in the African context, as the above-ground unit eliminates the need for deep excavation and offers a cost-effective and portable alternative to traditional concrete tanks (Pureco, 2023). Finally, Pureco designed and built faecal sludge treatment plants in Tamale, Takoradi and Kumasi, based on the EU engineering and WHO environmental emission standards. Each plant treats 1000 m³ of faecal sludge per day, benefiting over 3 million people in total. These facilities fill a critical infrastructure gap in rapidly urbanizing areas and significantly reduce the risk of environmental pollution, further supporting Ghana's public health goals (Pureco, 2025).

The other Hungarian company is Geogold Kárpátia, whose geoscience experts carried out an innovative groundwater research project in the Ngorongoro district of Northern Tanzania in 2019. The project – which was implemented at the invitation of the Help for the Massai Foundation and funded by the Hungarian Ministry of Foreign Affairs and Trade – aimed to alleviate the natural causes of migration by improving access to safe drinking water. During the fieldwork carried out between October and November 2019, the experts conducted hydrogeological mapping, collected and analyzed water samples at three locations. Based on the data, two potential locations for new drinking water wells were identified. In addition, the geoscience experts surveyed 85 schools in the region, collecting data on student numbers, access to water, infrastructure and technical condition in order to support future water infrastructure planning and funding applications (Hungarian Water Partnership, 2019).

In recent years, Hungary's international development cooperation has expanded to include not only public and private sector initiatives, but also the active participation of non-profit

actors. Most prominent among these is the Hungarian Charity Service of the Order of Malta, which has implemented a number of high-impact projects in the water and sanitation sectors in East Africa. Between 2013 and 2023, the organization implemented eight major initiatives in Kenya, Tanzania and Uganda, addressing both humanitarian needs and long-term infrastructure challenges. Kenya has become a primary focus of the Hungarian Charity Service of the Order of Malta regional engagement, with a total of six projects implemented between 2011 and 2025. The projects varied in scope and scale, and targeted the most vulnerable population groups, including refugees, internally displaced persons and marginalized urban communities. Specific activities included the establishment of clean water access points in and around the Kakuma refugee camp, the installation of water systems in schools and health facilities in Nairobi and Turkana counties, and the development of public health infrastructure for the displaced and impoverished population (Hungarian Maltese Charity Service, 2025a). In addition to Kenya, the Hungarian Charity Service of the Order of Malta also carried out targeted interventions in Tanzania and Uganda. In 2018, a €500,000 project in Tanzania implemented improvements in the areas hosting refugees in the areas of water supply, public health and hygiene, thereby helping to relieve the pressure on local infrastructure due to the increase in the displaced population (Hungarian Maltese Charity Service, 2025b). Similarly, in Uganda, the organization implemented a €500,000 program to expand access to safe drinking water and basic sanitation in rural areas between 2013 and 2016. (Hungarian Maltese Charity Service, 2025c).

The other Hungarian non-profit organization is the Afrikért Alapítvány, which implemented the installation of hand pumps, the renovation of wells, and training in water, sanitation, and wastewater treatment in Kinshasa in 2015, with the aim of improving healthcare and school attendance. Approximately 750 people directly benefited from the project, including 700 students, 40 employees, and 11 orphans at Othniel College. The indirect target group included approximately 1,190 family members and an additional 15,000–20,000 residents, bringing the total reach to approximately 22,000 people (Afrikért Alapítvány, 2020).

Table 4: Overview of Hungary's Water-Sector Project Portfolios in Africa by Actor Type, Scale, Geography, and Focus Areas.

Actor types	*Number of projects*	*Budget range*	*Countries involved*	*Primary focus areas*
Government	10	4 million USD	Cabo Verde, Ethiopia, Ghana, Kenya, Nigeria, Tanzania, Tunisia, Uganda	1. Governance & Adaptive Water Management, 2. Technological Innovation for Treatment & Reuse, 3. Community & Humanitarian Service Delivery
Non-profit sector	10	4 million EUR	Democratic Republic of Congo, Kenya, Tanzania, Uganda,	1. WASH Infrastructure & Service Delivery 2. Capacity Building & Community Engagement 3. Monitoring, Evaluation & Advocacy

Actor types	*Number of projects*	*Budget range*	*Countries involved*	*Primary focus areas*
Private sector	4	10 million EUR	Ghana, Tanzania	1. Water Treatment & Wastewater Management 2. Water Storage & Resource Development 3. Operational Capacity Building

Table 4 shows that the Hungarian government is overseeing a broad, multi-country program of 10 projects that focus on governance reform, climate-resilient agriculture, and piloting treatment and reuse technologies for community service delivery. Nonprofit organizations mirror this scale, but are more narrowly focused on expanding WASH infrastructure, building capacity, and participatory monitoring and advocacy in high-need areas in the Democratic Republic of the Congo, Kenya, Tanzania, and Uganda. In contrast, private companies have undertaken a smaller number of projects – concentrated in Ghana and Tanzania – that have installed capital-intensive treatment and storage infrastructure along with training professional operators. These complementary roles – policy leadership by governments, community-based implementation by non-profit organizations, and technology mobilization by the private sector – combined to form a complex approach that contributed to strengthening Africa's water security.

Conclusion

The literature review suggests that water insecurity in Africa is the result of an interplay of environmental, demographic and infrastructural factors. Recurrent droughts, erratic rainfall patterns and extreme weather events are severely undermining the stability of the continent's water resources. In addition, these challenges are exacerbated by rapid population growth that significantly increasing the pressure on already fragile water systems. The continent's water supply infrastructure varies considerably in terms of both coverage and functionality. Many regions continue to depend on outdated, fragmented or inadequate systems that cannot meet growing demand. Access to drinking water is highly uneven across Africa, both geographically and in terms of the rural-urban divide. Northern and Southern Africa show the highest levels of safely managed water supply in urban areas, while rural communities in these same regions continue to face significant gaps. Eastern and Western Africa present a more heterogeneous picture, while Central Africa emerges as the most water-scarce subregion, making it the region most in need of interventions.

Hungary has stepped up its engagement since 2010 by expanding its official development assistance, quadrupling its total volume by 2021. These efforts have been accompanied by a more coordinated approach involving public institutions, private companies and civil society actors. Within the water sector, Hungary has contributed to a range of activities, including infrastructure development, technology transfer, capacity building and humanitarian assistance. From a government perspective, Hungary has shown a growing and positive presence in African water initiatives, indicating a clear commitment to deepening such partnerships in the future. Nonetheless, the study also points out that Hungarian humanitarian actors currently have a greater presence in the field of water security in Africa than actors from private sector. This imbalance suggests

that the Hungarian private sector could be further encouraged and supported to expand its participation in African water development efforts. Furthermore, the GIS data presented in the study highlighted regions where dependence on unimproved water services remains alarmingly high. It is noteworthy that Hungary is already active in some of the most affected countries, however, there is further opportunities for engagement, particularly in countries such as Madagascar, the Central African Republic and Niger, among others.

In order to play a greater role in strengthening water security in Africa, the Government of Hungary should proactively initiate diplomatic and development dialogues with African countries with the highest per capita dependence on unimproved or surface water services and where Hungarian actors are currently absent. A new development strategy could prioritize rural areas, as rural communities in these countries face the most severe service gaps and could therefore benefit significantly from targeted interventions. Furthermore, Hungary should mobilize tailored programs to strengthen the international competitiveness of its water technology companies. Finally, all bilateral water programs should be guided by joint development frameworks that align Hungary's economic interests with the development goals of the host country. Beyond sole technology transfer, project agreements should include comprehensive capacity-building elements, such as practical training for local water professionals, community-based maintenance workshops, and knowledge exchange platforms to ensure sustainable operations, institutional ownership, and long-term resilience. Taken together, these measures would not only accelerate progress towards Sustainable Development Goal 6 in the most vulnerable regions of Africa, but would also strengthen Hungary's position as a responsible, collaborative partner in international development.

This study contributed to filling a significant gap in the literature and provided a comprehensive presentation of Hungary's engagement in water security on the African continent, especially over the past decade. As regards limitations, this research relied exclusively on secondary data provided by international organizations, with the most recent data available only up to 2022. In addition, data from national statistical offices in several African countries were either unavailable or inconsistent, further limiting the comprehensiveness of the analysis. Information on Hungary's activities was obtained from publicly available online databases and news sources. It is likely that additional stakeholders, especially financiers and agencies involved in government cooperation, exist, but were not identified due to limited access to internal government records. Future studies could benefit from better data availability and direct access to institutional actors involved in Hungarian-African development cooperation.

Acknowledgement

The author gratefully acknowledges that the publication of this work was made possible through the sponsorship and support provided by the International Conference on Technological, Educational, Social, and International Challenges in the Changing World, the Chair of the Conference (Dr. Júlia Szőke), and the Széchenyi István University.

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Authors' Declarations and Essential Ethical Compliances

Author's Contributions (in accordance with ICMJE criteria for authorship)

This article is 100% contributed by the sole author. He conceived and designed the research or analysis, collected the data, contributed to data analysis & interpretation, wrote the article, performed critical revision of the article/paper, edited the article, and supervised and administered the field work.

Funding
No financial support was received for the research and writing of this article. However, Széchenyi István University, Győr, Hungary has sponsored the publishing of this article.

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